# Machine Vision Laboratory

*Integrating imaging software and hardware solutions to develop prototype vision-based systems*

With the advance of imaging systems, video information has proliferated into many commercial areas, such as manufacturing, communication, the medical industry, and security. Over the past three decades, research in analyzing image information has shown that machine vision can be a reliable solution to industrial automations, such as alignment, assembly and inspection, medical diagnostics and operation, and remote robotics operation.

At LLNL's Machine Vision Laboratory (MVL), we are committed to working with U.S. industry to help customize this technology to their needs. The MVL provides integrated imaging software and hardware solutions for developing prototype vision-based systems. Such systems can be used in industrial inspection, automation, robotics, and medical imaging.

### State-of-the-art facility

The MVL has state-of-the art computers, real-time image-processing hardware, and an extensive set of software, including pattern-recognition algorithms, neural networks, image processing, and two- and three-dimensional computer vision. The MVL also has a wide range of imaging systems, such as charge-coupled device (CCD) monochrome and color area cameras, line-scan cameras, and microscopic cameras. These imaging systems can be combined with existing robots and motion control for prototyping applications.

**APPLICATIONS**

- *Stereo vision*
- *Vision-based automation*
- *Visual tracking*
- *Robot grasping*
- *Web inspection*

### MVL-developed capabilities include:

**Stereo vision.** Three-dimensional surface data are generated by registering images from a stereo pair of CCD cameras. This data-capturing capability can be applied to robotics, modeling, virtual reality, and biometric systems.

**Vision-based automation.** We are developing a vision-based photonics device assembly workstation. Microscopic vision is used for metrology, positioning, alignment, and inspection.

**Visual tracking.** We have developed prototypes of two real-time tracking and motion-detection systems: one for real-time tracking of fast moving objects; the other for real-time target tracking and ranging from a moving platform.

*Three-dimensional reconstruction of a human face using stereo computer vision.*

**Robot grasping.** Using the three-dimensional surface data generated from stereo vision, we have developed an autonomous robot grasping capability. This capability has been applied to the autonomous sorting of contaminated waste objects from a drum.

**Web inspection.** We are developing a web inspection system for inspecting color printed and textured products. Current capabilities include an inspection platform with a motorized roller, color and monochrome line-scan and area cameras, line light sources, and real-time image processing hardware.

**Availability:** We are seeking collaborations with industry to develop machine vision systems for specific applications.

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